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GEOLOGY AND PALEONTOLOGY.

Origin of the Continental Area of Australia.—The following account of the probable origin of the Australian Continent is given by Professor David in a presidential address before the Linnean Society of New South Wales :

" That the movements of the earth's crust which laid the foundations of the Australian Continent commenced in Pre-Cambrian time is conclusively proved by the vast amount of folding to which the Archean rocks at Androssan and in the Mount Macdonnell Ranges were subjected before the deposition of the earliest Cambrian sediments.

" In Tasmania the crumpling of the crust took place between E. N. E. and W. S. W. directions, so that the axes of the fold trend N. N. W. and S. S. E.

" At St. Vincent's Gulf, near Adelaide, the folds run chiefly N. E. and S. W., and N. N. E. and S. S. W., so as to meet, if produced, a prolongation of the Tasmanian axes toward the N. W., nearly at right angles. In the Macdonnell and Musgrave Ranges, the trend is E. and W., and in the Kimberly District of West Australia, N. W. and S. E., with a secondary folding S. W. and N. E.

" It is not certain whether, either in Australia or Tasmania, there was any land surface in Archean time, but the conglomerates in the Archean and in the succeeding Cambrian, and the ripple-marked flaggy quartzites (if they are Archean or Cambrian and not Lower Silurian) imply shallow seas, with probably a neighboring land surface. It is improbable, too, that the Archean strata should have been as powerfully folded, as observation shows them to have been, in Pre-Cambrian time, without some areas being elevated sufficiently to form land.

" In Australia, therefore, there was probably land and probably contemporaneous life, at all events, in the seas, in Pre-Cambrian time, the latter assumption being rendered probable by the occurrence of the beds of limestone and contemporaneous (?) iron-ores and graphite in the Archean rocks of South Australia, and of limestone and contemporaneous (?) ironstone in the Archean rocks of Tasmania, and also by the great diversity of forms of animal life met with in the succeeding Lower Cambrian rocks.

" The earliest known folding of the Australian region took place in Pre-Cambrian time in Australia and Tasmania, and, at least, as far back as Pre-Silurian time in New Zealand. In Victoria, South Australia and Tasmania, the original lines of folding along the Tasmanian and Adelaide axes continued to be developed all through the Cambrian, Silurian and part of Devonian time, and along the Tasmanian axis during a portion, at least, of the Carboniferous Period. The Kosciusko axis, however, would appear to be of somewhat later origin than the Tasmanian and Adelaide and New Zealand axes. Possibly, an extension northwards of the Kosciusko axis in Carboniferous time reclaimed for the Australian Continent an area in New England, part of which had formed the floor of an ocean of moderate depth.

"At least five important foldings have taken place in the Australasian region between Pre-Cambrian and Carboniferous time inclusive, and each has had an important influence on the evolution of the continental area of Australia, but the last extensive folding, that of the Gympie, which took place in Carboniferous time, has been the chief factor in the evolution of the Main Dividing Range of Eastern Australia in the northern portion of New South Wales and in the greater part of Queensland.

"The folding along the New Zealand axis which commenced in Pre-Silurian time, was continued up to the close of the Mesozoic Era." (Proceeds. Linn. Soc. N. S. W., 2d Series, Vol. VIII, 1894.)

The Carboniferous System of Brazil.—In view of the recent discussions of correlation of the Upper Carboniferous formations of Brazil, Professor Derby has published a description of material collected from Amazonian localities. The list includes 122 species from Upper Carboniferous strata. The descriptions are prefaced with remarks on the geology of the localities in which this fauna is represented, and a comparison between the fauna of Lower Amazons and that of Southern Brazil is given as follows:

"Although there is, on the Lower Amazons, a considerable thickness, probably from 1000 to 2000 feet, of supposed Upper Carboniferous rocks, all the known fossils are marine and form a single, or two closely related horizons. As stated in my paper on the Brachiopods, the Andean Carboniferous fauna is about of the same horizon. In southern Brazil, where there is an extensive Carboniferous area, fresh-water conditions seem to have prevailed and marine fossils have thus far proved to be rare and unsatisfactory. So far as their characters have been made out, they agree with the prevailing vegetable and reptilian types in presenting a decided Permian, or, perhaps, early Secondary facies. Both in its physical and in its paleontological characteristics this formation of southern Brazil offers considerable analogies with those of South Africa, India, and Australia, containing the Glossopteris flora (see Waagen, Neues Jahrbuch, 1888, II, pp. 172–177). If, on further study, this analogy is found to hold good, we shall have at, or near, the close of the Paleozoic, two strongly contrasted chains of similar formations extending from east to west across the whole present land area of the globe. The one with an abundant and characteristic marine fauna reaches from China to Bolivia with the Salt Range and the Lower Amazons (also the Pichis River locality in Peru) as intermediate links; the other, with predominant freshwater and terrestrial conditions, reaches from Australia through India and Africa to southern central South America." (Journ. Geol., Vol. II, 1894.)

The Affinities of Agriochaerus.—In determining the relationship of Agriochaerus to the Oreodontidae, Dr. Scott briefly recapitulates the resemblances and differences of the two families, and gives, as a conclusion, that Agriochaerus is the last term in a succession of species which form a curiously specialized offshoot of the Oreodontidae, its divergencies from that family being principally the results of a change in the functions and uses of the feet. The separation of the two series was probably already established in the Uinta Eocene, for, in spite of its somewhat intermediate character, Protoreodon can be a forerunner only of the oreodonts. The Bridger beds may be expected to yield the common ancestor of the two series, and this animal will probably turn out to be a pentadactyl form, with buno-selenodont dentition and quinquetuberculate upper molars, the unpaired lobe in the anterior half of the crown. (Proceeds. Amer. Philos. Soc., Vol. XXXIII, 1894.)

The Mastodons of Russia.—The conclusions reached by Mme. Marie Pavlov in her study of the Mastodons of Russia and their relations to the Mastodons of other regions, are as follows:

(1) It is the group of *Mastodon* called *Zygolophodon* represented by *M. borsonii*, *M. americanus*, and their varieties, which had a very great distribution in southwest Russia during the Miocene and Pliocene periods.

(2) None of these forms is specific to Russia, all having been widely spread in West Europe and North America.

(3) The group of *Mastodon* called *Bunolophodon* is known only till now through a very limited number of specimens of *M. arvernensis*,

while this group is widely represented in West Europe, Asia and America.

(4) The close resemblance between the Mastodons of Eur-Asia and America confirms once more the connection which exists between the two continents during the Tertiary period. (Bull. Soc. des Naturl. Moscou, 1894, No. 2.)

Geological News.—Paleozoic.—In a paper on the Potsdam and calciferous formations of Quebec and Eastern Ontario, Mr. R. W. Ells submits evidence to show that the real line of division between the Cambrian and Cambro-Silurian systems should be placed at the close of the Georgia slate and red sandrock divisions, and that the series from the base of the typical Potsdam sandstone to the summit of the Utica and Hudson River formations should constitute the system known as the Cambrian-Silurian or Ordovician, in view of the fact that there is no stratigraphical break in the sequence of these formations, nor any want of harmony in the succession of organic life as furnished by the evidence of the contained fossils. (Trans. Roy. Soc. Canada, Section IV, 1894.)

The report on the Insect Fauna of the Rhode Island Coal Field, by Dr. Scudder, is published as Bulletin No. 101 of the U. S. Geol. Survey. The collection is an unusually interesting one, as all the species, without exception, are new to science and unknown elsewhere. They consist of Anthracomartus, the first discovered Arachnid in the Carboniferous deposits in the eastern United States; a new genus of Neuropteroidea and one of Protophasmida allied to some from the Carboniferous beds of Commentry, in France; and a number of cockroaches, represented only by their wings. These last show great variety of form. The two subfamilies of Palaeoblattariae are represented by three genera, including nearly a dozen species.

Mesozoic.—Various offices have been attributed to the Aptychus, but the recent discovery of an Ammonite (*Oppelia subradiata* Sow.), from Dundry, now in the British Museum, with the Aptychus *in situ* closing the orifice, would seem to disclose the true nature of that body, viz., that of an operculum. In view of this fact, Professor E. H. L. Schwarz shows how all the theories against its use as an operculum can be met with equally plausible ones in favor of that view, and throws the weight of his opinion in favor of such use. (Geol. Mag., Oct., 1894.)

A large Clypeastrid is reported from the Cretaceous formation near Colorado Springs, Colorado. Upon examination, Mr. F. W. Cragin pronounces it not only the type of a new species, but a new genus also, which he calls Scutellaster. He believes that this genus may be regarded as a synthetic or generalized type from which have been evolved *Scutella* on the one hand and *Clypeaster* on the other. (Am. Geol., Feb., 1895.)

Recent collections from the Cretaceous Formation on Long Island have yielded forty-six additions to the previously recognized cretaceous flora of that region, nine of which are new species. They are described and figured by Mr. Hollick. (Bull. Torrey Bot. Club, Vol. 21, 1894.)

The presence of silicified paleozoic fossils in the Long Island gravel at Lloyd's Neck, and in the vicinity of Glen Cove, establishes its identity, in Mr. Hollick's opinion, with the "yellow gravel" of New Jersey. The author is inclined to refer some of the gravels on Martha's Vineyard to the same horizon. In the same paper the author discusses the Cretaceous clays of Long Island, and in view of the evidence of the fossil flora he correlates them wiih the Amboy clays of New Jersey, the Dakota group of the west, and the Lower Atane beds of Greenland. (Trans. N. Y. Acad. Sci., XIII, 1894.)